AMENDMENTS TO CLAIMS

- This listing of Claims shall replace all prior versions, and listings, of Claims in the application:

1. (Currently Amended) ~~A cathode sputtering~~ An apparatus ~~for forming a uniform thickness layer of a selected material on at least one surface of at least one substrate/workpiece in a multi-stage process comprising deposition of a plurality of sub-layers,~~ comprising:

(a) a first group of spaced-apart cathode/target assemblies ~~comprising annular-shaped magnetron magnet assemblies;~~ and

(b) a transportation unit for transporting at least one substrate/workpiece past each cathode/target assembly of said first group of cathode/target assemblies for deposition of a first plurality of sub-layers on a first surface of said at least one ~~substrate/workpiece; wherein:~~ substrate/workpiece,

~~(i) each cathode/target assembly of said first group of cathode/target assemblies comprises a sputtering surface oriented substantially parallel to said first surface of said at least one substrate/workpiece; and~~

~~(ii)~~ wherein said first group of cathode/target assemblies is adapted to provide said first plurality of sub-layers with different sputtered film thickness profiles, such that said first plurality of sub-layers collectively form said uniform thickness layer of said selected material, and

~~wherein the annular-shaped magnetron magnet assemblies have progressively increasing diameters, and~~

~~a distance between each sputtering surface and the at least one substrate/workpiece is progressively larger.~~

wherein said first plurality of sub-layers have an inner diameter thickness that is different from an outer diameter thickness.

2. (Original) The apparatus as in claim 1, further comprising:

(c) a second group of spaced-apart cathode/target assemblies opposite said first group of spaced-apart cathode/target assemblies and adapted for forming a uniform thickness layer of said selected material on a second surface of said at least one substrate/workpiece in a multi-stage process comprising deposition of a second plurality of sub-layers, wherein:

(i) each cathode/target assembly of said second group of cathode/target assemblies comprises a sputtering surface oriented substantially parallel to said second surface of said at least one substrate/workpiece;

(ii) said second group of cathode/target assemblies is adapted to provide sub-layers with different sputtered film thickness profiles, such that said second plurality of sub-layers collectively form said uniform thickness layer of said selected material on said second surface of said at least one substrate/workpiece; and

(iii) said means for transporting said at least one substrate/workpiece past each cathode/target assembly of said first group of cathode/target assemblies further comprises means for transporting said at least one substrate/workpiece past each cathode/target assembly of said second group of cathode/target assemblies for deposition of said second plurality of sub-layers on said second surface of said at least one substrate/workpiece.

3. (Original) The apparatus as in claim 2, wherein:

the cathode/target assemblies of said first and second groups of cathode/target assemblies are in substantial vertical registry.

4. (Original) The apparatus as in claim 2, wherein:

the cathode/target assemblies of said first and second-groups of cathode/target assemblies are located in a single vacuum chamber.

5. (Cancelled)

6. (Original) The apparatus as in claim 2, wherein:

the cathode/target assemblies of said first and second groups of cathode/target assemblies are located in a plurality of vacuum chambers.

7. (Original) The apparatus as in claim 6, wherein:

said plurality of vacuum chambers form an in-line or a circularly-shaped arrangement of chambers.

8. – 10. (Cancelled)

11. (Original) The apparatus as in claim 2, wherein:

said means for transporting said at least one substrate/workpiece past said first and second groups of cathode/target assemblies for deposition of said first and second pluralities of sub-layers comprises means for mounting and transporting at least one disk-shaped substrate/workpiece.

12. (Original) The apparatus as in claim 2, further comprising:

(d) shield means in spaced adjacency to the periphery of the sputtering surface of each cathode/target assembly.

13. (Currently Amended) A method ~~of forming a uniform thickness layer of a selected material on at least one surface of at least one substrate/workpiece by means of a multi- stage process comprising sputter deposition of a plurality of sub-layers,~~ comprising steps of:

(a) providing a multi-stage cathode sputtering apparatus comprising a first group of spaced-apart cathode/target assemblies ~~comprising annular-shaped magnetron magnet assemblies~~ and a transportation unit for transporting at least one substrate/workpiece past each cathode/target assembly of said first group of cathode/target assemblies, ~~each cathode/target assembly comprising a sputtering surface oriented substantially parallel to said first surface of said at least one substrate/workpiece during transport of said at least one substrate/workpiece past said first group of cathode/target assemblies,~~ said first group of cathode/target assemblies adapted for providing different sputtered film thickness profiles; and

(b) transporting said at least one substrate/workpiece past each cathode/target assembly while providing different sputtered film thickness profiles from at least some of said

cathode/target assemblies, such that a first plurality of sub-layers is deposited on said first surface of said at least one substrate/workpiece which collectively form said uniform thickness layer of said selected material,

wherein said first plurality of sub-layers have an inner diameter thickness that is different from an outer diameter thickness.~~step (a) further comprises a second group of spaced-apart cathode target assemblies, each comprising a sputtering surface oriented substantially parallel to a second surface of said at least one substrate/workpiece during transport of said at least one substrate/workpiece past each cathode/target assembly of said second group of cathode/target assemblies, said second group of cathode/target assemblies providing different sputtered film thickness profiles, and the sputtering surfaces of at least one cathode/target assembly of said first and second groups of cathode/target assemblies are located at a different spacing from the first and second surfaces of said at least one substrate/workpiece than another of the cathode/target assemblies; and~~

~~step (b) further comprises depositing a second plurality of sub-layers on said second surface of said at least one substrate/workpiece which collectively form said uniform thickness layer of said selected material, and~~

~~transporting at least one disk-shaped precursor substrate for a perpendicular magnetic recording medium past each annular-shaped cathode/target assembly of said first and second groups of cathode/target assemblies,~~

~~wherein each annular-shaped magnetron magnet assembly has at least one progressively increasing diameter and~~

~~a distance between each sputtering surface and the at least one substrate/workpiece is progressively larger.~~

14. (Cancelled)

15. (Currently Amended) The method according to claim 13, wherein:

said first group and ~~second groups~~ a second group of spaced-apart cathode target assemblies are in substantial vertical registry; and

step (b) comprises substantially simultaneously forming said uniform thickness layer of said selected material on each of said first and second surfaces of said at least one substrate/workpiece.

16. (Currently Amended) The method according to claim 13, wherein:

the cathode/target assemblies of said first group and ~~second groups~~ a second group of cathode/target assemblies form an in-line or circular-shaped arrangement in a single vacuum chamber.

17. (Currently Amended) The method according to claim 13, wherein:

the cathode/target assemblies of said first group and ~~second groups~~ a second group of cathode/target assemblies are located in a plurality of vacuum chambers and said plurality of vacuum chambers form an in-line or circular-shaped arrangement.

18. – 19. (Cancelled)

20. (Currently Amended) The method according to claim 13, wherein said means for transporting said at least one substrate/workpiece past each of said first group and ~~second groups~~ a second group of cathode/target assemblies comprises means for mounting and transporting at least one disk-shaped substrate/workpiece.

21. (Previously presented) The method according to claim 13, wherein the multi- stage cathode sputtering apparatus further comprises shield means spaced adjacent the periphery of the sputtering surface of each cathode/target assembly.

22. (Cancelled)

23. (Currently Amended) The method according to claim 13, wherein:

step (b) comprises forming an about 500 to about 4,000 Å thick layer of a magnetically soft underlayer (SUL), the SUL is selected from the group consisting of: Ni, NiFe (Permalloy),

Co, CoZr, CoZrCr, CoZrNb, CoFeZrNb, CoFe, Fe, FeN, FeSiAl, FeSiAlN, FeCoB, or FeCoC on ~~said first and second surfaces of~~ said at least one ~~precursor~~ substrate.

24. (Currently Amended) ~~A cathode sputtering~~ An apparatus ~~for forming a uniform thickness layer of a selected material on at least one surface of at least one substrate/workpiece,~~ comprising:

a group of spaced-apart deposition stations having a first group of annularly-shaped magnetron magnet assemblies, each annularly-shaped magnetron magnet assembly having at least one diameter corresponding to a thickness profile for depositing a material; and ~~the selected material and a sputtering surface arranged substantially parallel to the at least one substrate/workpiece; and~~

a transportation unit for transporting ~~the~~ at least one substrate/workpiece past each deposition station,

wherein the thickness profile for each annularly-shaped magnetron magnet assembly is different,

the selected material is sequentially deposited as sub-layers having different thicknesses corresponding to the different thickness profiles,

the deposition of the sub-layers result in the uniform thickness layer on the at least one substrate/workpiece, and

~~a distance between each sputtering surface and the at least one substrate/workpiece is progressively larger.~~

the sub-layers have an inner diameter thickness that is different from an outer diameter thickness.

25. (Previously Presented) The apparatus as in claim 24, further comprising:

a second group of annularly-shaped magnetron magnet assemblies opposite the first group of annularly-shaped magnetron magnet assemblies for forming a uniform thickness layer of the selected material on a second surface of the at least one substrate/workpiece; and

a transportation unit for transporting the at least one substrate/workpiece past each cathode/target assembly of the second group of annularly-shaped magnetron magnet assemblies for deposition of the sub-layers on the second surface of the at least one substrate/workpiece,

wherein each cathode/target assembly of the second group of annularly-shaped magnetron magnet assemblies comprises a sputtering surface oriented substantially parallel to the second surface of the at least one substrate/workpiece, and

the second group of annularly-shaped magnetron magnet assemblies provides sub-layers with different sputtered film thickness profiles, such that the sub-layers collectively form the uniform thickness layer of the selected material on the second surface of the at least one substrate/workpiece.

26. (Cancelled)

27. (Previously Presented) The apparatus as in claim 1, wherein the at least one diameter of each annular-shaped magnetron magnet assembly is an inner diameter.

28. (Previously Presented) The apparatus as in claim 1,wherein the at least one diameter of each annular-shaped magnetron magnet assembly is an outer diameter.

29. (Previously Presented) The method according to claim 13, wherein the at least one diameter of each annular-shaped magnetron magnet assembly is an inner diameter.

30. (Previously Presented) The method according to claim 13, wherein the at least one diameter of each annular-shaped magnetron magnet assembly is an outer diameter.

31. (Previously Presented) The apparatus as in claim 24, wherein the at least one diameter of each annularly-shaped magnetron magnet assembly is an inner diameter.

32. (Previously Presented) The apparatus as in claim 24, wherein the at least one diameter of each annularly-shaped magnetron magnet assembly is an outer diameter.